

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claim 1 (previously presented): A method for estimating a virtual patient's fasting plasma glucose (FPG) level, comprising:

determining the virtual patient's basal hepatic production (FPG_0);

determining the virtual patient's insulin level (I);

calculating the virtual patient's FPG at time t by solving an equation

$$FPG(t) = FPG_0 / (I * E), \text{ wherein } E \text{ is a value representing efficiency of insulin use; and}$$

outputting at least one value for the virtual patient's FPG at time t to a user.

Claim 2 (previously presented): The method of claim 1, wherein E is scaled such that $E = 1$ in the absence of diabetes and $0 \leq E < 1$ in the presence of diabetes.

Claim 3 (previously presented): The method of claim 1, wherein for type 2 diabetes, an equation representing E is:

$$E(DF_2) = \left(a + b / \left(1 + (DF_2 / c)^d \right) \right)^{\frac{1}{2}}, \text{ wherein the parameters } a, b, c, \text{ and } d \text{ are set to fit}$$

data for a population that is represented by the virtual patient, and DF_2 is a type 2 diabetes feature that represents an incidence of type 2 diabetes for the virtual patient.

Claim 4 (currently amended): The method of claim 3, wherein

$$DF_2(t) = \left(1 - \exp \left(-a * IGT(\xi_3) / \left(1 + \exp \left(\frac{(t-b)}{c} \right) \right) \right) \right) * RBMI(BMI) / \xi_2$$

$$DF_2(t) = \left(1 - \exp \left(-a_1 * IGT(\xi_3) / \left(1 + \exp \left(-\frac{(t-b_1)}{c_1} \right) \right) \right) \right) * RBMI(BMI) / \xi_2, \text{ wherein } \xi_2 \text{ and } \xi_3$$

are random values selected from distributions for randomizing the virtual patient within the population, IGT is an impaired glucose tolerance value indexed by the random value ξ_3 , $RBMI$ is a relative risk associated with the virtual patient's body mass index (BMI), and ξ_1 and ξ_3 are random values selected from distributions for randomizing the virtual patient within the population the parameters a_1 , b_1 , and c_1 , are set to fit data for the population that is represented by the virtual patient.

Claim 5 (currently amended): The method of claim 4, wherein the $RBMI$ is represented by:

$$\cancel{RBMI(BMI) = a + b / \left(1 + e^{-\frac{(BMI-c)}{d}} \right)} \quad \underline{RBMI(BMI) = a_2 + b_2 / \left(1 + e^{-\frac{(BMI-c_2)}{d_2}} \right)}, \text{ and the}$$

parameters a_2 , b_2 , c_2 , and d_2 , are set to fit data for the population that is represented by the virtual patient.

Claim 6 (currently amended): The method of claim 4, wherein IGT is represented by:

$$IGT(\xi_3) = 2(1 - \xi_3)$$

wherein the random value ξ_3 is a random value designed to cause so that the occurrence of diabetes in virtual patients corresponds to have the same types of interpersonal variations that occur in real people the population that is represented by the virtual patient.

Claim 7 (previously presented): The method of claim 1, wherein said determining said virtual patient's basal hepatic production in type 2 diabetes includes solving an equation $FPG_0(t) = G(t) * H(DF_2(t))$, wherein $G(t)$ represent a basal production in people who do not have diabetes, H represents a degree of insulin resistance in a person with diabetes, and DF_2 is a type 2 diabetes feature that represents an incidence of type 2 diabetes for the virtual patient.

Claim 8 (previously presented): The method of claim 7, wherein

$H(DF_2(t)) = 1 / (\text{MAX}[E^2(DF_2(t+a)), b])$, and the parameters a and b are set to fit data for a population that is represented by the virtual patient.

Claim 9 (previously presented): The method of claim 7, wherein

$G(t) = (a + bt^{1.5} - c * t^3 + \Delta_g) / (d - e \exp(-DF_2(t)\xi_2))$, wherein Δ_g represents a variance of basal hepatic production across individuals, the parameters a, b, c, d, and e are set to fit data for a population that is represented by the virtual patient, and ξ_2 is a random value selected from a distribution for randomizing the virtual patient within the population.

Claim 10 (previously presented): The method of claim 1, wherein

$I(DF_1, DF_2) = H(DF_2) * E(DF_2) / (1 + \exp((DF_1 - a)/b))$, and wherein DF_1 is a type 1 diabetes feature that represents an incidence of type 1 diabetes for the virtual patient, DF_2 is a type 2 diabetes feature that represents an incidence of type 2 diabetes for the virtual patient, H represents a degree of insulin resistance in a person with diabetes, and the parameters a and b are set to fit data for a population that is represented by the virtual patient.

Claims 11-30 (cancelled).

Claim 31 (previously presented): An apparatus for estimating a virtual patient's fasting plasma glucose (FPG) level, the apparatus comprising:

means for determining the virtual patient's basal hepatic production (FPG_0);

means for determining the virtual patient's insulin level (I);

means for calculating the virtual patient's FPG at time t by solving an equation

$FPG(t) = FPG_0 / (I * E)$, wherein E is a value representing efficiency of insulin use; and

means for outputting at least one value for the virtual patient's FPG at time t to a user.

Claim 32 (previously presented): The apparatus of claim 31, wherein E is scaled such that $E = 1$ in the absence of diabetes and $0 \leq E < 1$ in the presence of diabetes.

Claim 33 (previously presented): The apparatus of claim 31, wherein for type 2 diabetes, an equation representing E is:

$$E(DF_2) = \left(a + b / \left(1 + (DF_2 / c)^d \right) \right)^{\frac{1}{2}}, \text{ wherein the parameters } a, b, c, \text{ and } d \text{ are set to fit data for a population that is represented by the virtual patient, and } DF_2 \text{ is a type 2 diabetes feature that represents an incidence of type 2 diabetes for the virtual patient.}$$

Claim 34 (currently amended): The apparatus of claim 33,

$$DF_2(t) = \left(1 - \exp \left(-a * IGT(\xi_3) / \left(1 + \exp \left(\frac{(t-b)}{c} \right) \right) \right) \right) * RBMI(BMI) / \xi_2$$

$$DF_2(t) = \left(1 - \exp \left(-a_1 * IGT(\xi_3) / \left(1 + \exp \left(-\frac{(t-b_1)}{c_1} \right) \right) \right) \right) * RBMI(BMI) / \xi_2, \text{ wherein } \xi_2 \text{ and } \xi_3$$

are random values selected from distributions for randomizing the virtual patient within the population, IGT is an impaired glucose tolerance value indexed by the random value ξ_3 , $RBMI$ is a relative risk associated with the virtual patient's body mass index (BMI), and ξ_1 and ξ_3 are random values selected from distributions for randomizing the virtual patient within the population the parameters a_1 , b_1 , and c_1 , are set to fit data for the population that is represented by the virtual patient.

Claim 35 (currently amended): The apparatus of claim 33, wherein the $RBMI$ is represented by:

$$RBMI(BMI) = a + b / \left(1 + e^{-\frac{(BMI-c)/d}{d}} \right) \quad RBMI(BMI) = a_2 + b_2 / \left(1 + e^{-\frac{(BMI-c_2)/d_2}{d_2}} \right), \text{ and the parameters } a_2, b_2, c_2, \text{ and } d_2, \text{ are set to fit data for the population that is represented by the virtual patient.}$$

Claim 36 (currently amended): The apparatus of claim 34, wherein *IGT* is represented by:

$$IGT(\xi_3) = 2(1 - \xi_3),$$

wherein the random value ξ_3 is a random value designed to cause so that the occurrence of diabetes ~~in virtual patients~~ corresponds to have the same types of interpersonal variations that occur in real people the population that is represented by the virtual patient.

Claim 37 (previously presented): The apparatus of claim 31, wherein said means for determining said virtual patient's basal hepatic production in type 2 diabetes includes means for solving an equation $FPG_0(t) = G(t) * H(DF_2(t))$, wherein $G(t)$ represent a basal production in people who do not have diabetes, H represents a degree of insulin resistance in a person with diabetes, and DF_2 is a type 2 diabetes feature that represents an incidence of type 2 diabetes for the virtual patient.

Claim 38 (previously presented): The apparatus of claim 37, wherein $H(DF_2(t)) = 1 / (MAX[E^2(DF_2(t+a)), b])$, and the parameters a and b are set to fit data for a population that is represented by the virtual patient.

Claim 39 (previously presented): The apparatus of claim 37, wherein $G(t) = (a + bt^{1.5} - c * t^3 + \Delta_g) / (d - e \exp(-DF_2(t)\xi_2))$, wherein Δ_g represents a variance of basal hepatic production across individuals, the parameters a , b , c , d , and e are set to fit data for a population that is represented by the virtual patient, and ξ_2 is a random value selected from a distribution for randomizing the virtual patient within the population.

Claim 40 (previously presented): The apparatus of claim 31, wherein $I(DF_1, DF_2) = H(DF_2) * E(DF_2) / (1 + \exp((DF_1 - a)/b))$, and wherein DF_1 is a type 1 diabetes feature that represents an incidence of type 1 diabetes for the virtual patient, DF_2 is a type 2

diabetes feature that represents an incidence of type 2 diabetes for the virtual patient, H represents a degree of insulin resistance in a person with diabetes, and the parameters a and b are set to fit data for a population that is represented by the virtual patient.

Claims 41-51 (cancelled).

Claim 52 (previously presented): A program storage device readable by a machine, tangibly embodying a program of instructions executable by the machine to perform a method for estimating a virtual patient's fasting plasma glucose (FPG) level, the method comprising:

determining the virtual patient's basal hepatic production (FPG_0);

determining the virtual patient's insulin level (I);

calculating the virtual patient's FPG at time t by solving an equation

$$FPG(t) = FPG_0 / (I * E), \text{ wherein } E \text{ is a value representing efficiency of insulin}$$

use; and

outputting at least one value for the virtual patient's FPG at time t to a user.

Claims 53-60 (cancelled).

Claim 61 (previously presented): The method of claim 1, wherein the at least one value based on the virtual patient's FPG at time t is saved in at least one file in a computer storage device.

Claim 62 (previously presented): The method of claim 3, further comprising:

setting values for the parameters a , b , c , and d by fitting the equation representing E to data for the population according to a least-squares criterion.

Claim 63 (previously presented): The apparatus of claim 31, wherein the at least one value based on the virtual patient's FPG at time t is saved to a computer-readable medium.

Claim 64 (previously presented): The apparatus of claim 33, further comprising:

means for setting values for the parameters a , b , c , and d by fitting the equation representing E to data for the population according to a least-squares criterion.

Claim 65 (previously presented): The program storage device of claim 52, wherein E is scaled such that $E = 1$ in the absence of diabetes and $0 \leq E < 1$ in the presence of diabetes.

Claim 66 (previously presented): The program storage device of claim 52, wherein for type 2 diabetes, an equation representing E is:

$$E(DF_2) = \left(a + b / \left(1 + (DF_2 / c)^d \right) \right)^{\frac{1}{2}}, \text{ wherein the parameters } a, b, c, \text{ and } d \text{ are set to fit data for a population that is represented by the virtual patient, and } DF_2 \text{ is a type 2 diabetes feature that represents an incidence of type 2 diabetes for the virtual patient.}$$

Claim 67 (currently amended): The program storage device of claim 66, wherein

$$DF_2(t) = \left(1 - \exp \left(-a * IGT(\xi_3) / \left(1 + \exp \left(-\frac{(t-b)}{c} \right) \right) \right) \right) * RBMI(BMI) / \xi_2$$

$$DF_2(t) = \left(1 - \exp \left(-a_1 * IGT(\xi_3) / \left(1 + \exp \left(-\frac{(t-b_1)}{c_1} \right) \right) \right) \right) * RBMI(BMI) / \xi_2, \text{ wherein } \xi_2 \text{ and } \xi_3$$

are random values selected from distributions for randomizing the virtual patient within the population, IGT is an impaired glucose tolerance value indexed by the random value ξ_3 , $RBMI$ is a relative risk associated with the virtual patient's body mass index (BMI), and ξ_1 and ξ_3 are random values selected from distributions for randomizing the virtual patient within the population the parameters a_1 , b_1 , and c_1 , are set to fit data for the population that is represented by the virtual patient.

Claim 68 (currently amended): The program storage device of claim 67, wherein the $RBMI$ is represented by:

~~$RBMI(BMI) = a + b / (1 + e^{-(BMI-c)/d})$~~ $RBMI(BMI) = a_2 + b_2 / (1 + e^{-(BMI-c_2)/d_2})$, and the parameters a_2 , b_2 , c_2 , and d_2 , are set to fit data for the population that is represented by the virtual patient.

Claim 69 (currently amended): The program storage device of claim 67, wherein *IGT* is represented by:

$$IGT(\xi_3) = 2(1 - \xi_3)$$

wherein the random value ξ_3 is ~~a random value designed to cause~~ so that the occurrence of diabetes in virtual patients corresponds to have the same types of interpersonal variations that occur in real people the population that is represented by the virtual patient.

Claim 70 (previously presented): The program storage device of claim 52, wherein said determining said virtual patient's basal hepatic production in type 2 diabetes includes solving an equation $FPG_0(t) = G(t) * H(DF_2(t))$, wherein $G(t)$ represent a basal production in people who do not have diabetes, H represents a degree of insulin resistance in a person with diabetes, and DF_2 is a type 2 diabetes feature that represents an incidence of type 2 diabetes for the virtual patient.

Claim 71 (previously presented): The program storage device of claim 70, wherein $H(DF_2(t)) = 1 / (MAX[E^2(DF_2(t+a)), b])$, and the parameters a and b are set to fit data for a population that is represented by the virtual patient.

Claim 72 (previously presented): The program storage device of claim 70, wherein $G(t) = (a + bt^{1.5} - c * t^3 + \Delta_g) / (d - e \exp(-DF_2(t)\xi_2))$, wherein Δ_g represents a variance of basal hepatic production across individuals, the parameters a , b , c , d , and e are set to fit data for a

population that is represented by the virtual patient, and ξ_2 is a random value selected from a distribution for randomizing the virtual patient within the population.

Claim 73 (previously presented): The program storage device of claim 52, wherein

$I(DF_1, DF_2) = H(DF_2) * E(DF_2) / (1 + \exp((DF_1 - a)/b))$, and wherein DF_1 is a type 1 diabetes feature that represents an incidence of type 1 diabetes for the virtual patient, DF_2 is a type 2 diabetes feature that represents an incidence of type 2 diabetes for the virtual patient, H represents a degree of insulin resistance in a person with diabetes, and the parameters a and b are set to fit data for a population that is represented by the virtual patient.

Claim 74 (previously presented): The program storage device of claim 52, wherein the at least one value based on the virtual patient's FPG at time t is saved to a computer-readable medium.

Claim 75 (previously presented): The program storage device of claim 66, wherein the method further comprises:

setting values for the parameters a , b , c , and d by fitting the equation representing E to data for the population according to a least-squares criterion.